

REMARKS

Claims 25, 27-30, and 33-48 are pending and have been rejected under 35 U.S.C. §112, first and second paragraphs. Claims 25, 27-30, 33-38, 40-45, and 48 have been rejected under 35 U.S.C. §103. Claims 25, 35, 36, 38, 39, and 44-48 have been amended. Support for the amendments to the claims is found at least in the original disclosure and in the published application WO 2005/069308, page 13, lines 4-6. Claims 1-24, 26, 31, and 32 have been cancelled in previous correspondence. Claims 25, 27-30, and 33-48 remain for consideration upon entry of the present Amendment. No new matter has been added.

Claim Rejections – 35 U.S.C. §112, first paragraph

Claims 25, 27-30, and 33-48 have been rejected under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the enablement requirement. The Examiner alleges that the claims contain subject matter that was not described in the specification in such a way as to enable one skilled in the relevant art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In particular, the Examiner states that claims 25 and 48 recite the limitation “each sleeve being manufactured in a sheet-shaped material,” which allegedly means that the sleeve is produced internal to, within, or inside a sheet-shaped material.

Claims 25 and 48 have been amended. In view of the amendments, Applicants respectfully assert that claims 25 and 48 (and claims 27-30 and 33-47, which depend from claim 25) comply with the written description requirement within the meaning of 35 U.S.C. §112, first paragraph. Accordingly, Applicants respectfully request that the Examiner withdraw the rejections of the claims under 35 U.S.C. §112, first paragraph.

Claim Rejections – 35 U.S.C. §112, second paragraph

Claims 25, 27-30, and 33-48 have also been rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as the invention. The claims are alleged to be vague, indefinite, and incomplete, and their metes and bounds allegedly cannot be determined because

the claims are inconsistent with the specification. The Examiner refers Applicants to the rejections made under 35 U.S.C. §112, first paragraph.

Regarding claims 35 and 38, the Examiner alleges that the terms “sleeve-like” and “wave-like,” respectively, render the claims indefinite because the claims include elements not actually disclosed (those encompassed by “like”), thereby rendering the scope of the claims unascertainable.

Claim 28 recites the limitation “one of said long sides.” The Examiner alleges that there is insufficient antecedent basis for this limitation in the claim.

Claims 25, 35, 38, 45, and 48 have been amended. The Examiner’s reference to claim 28 is misplaced, as claim 45 appears to include the language forming the basis of the Examiner’s rejection. In view of the foregoing amendments, Applicants respectfully assert that claims 25 and 48 (and claims 27-30 and 33-47, which depend from claim 25) are definite within the meaning of 35 U.S.C. §112, second paragraph. Accordingly, Applicants respectfully request that the Examiner withdraw the rejections of the claims under 35 U.S.C. §112, second paragraph.

Claim Rejections – 35 U.S.C. §03

Claims 25, 27, 33-38, 40-44, and 48 have been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over either one of U.S. Patent No. 5,225,154 to Kanno et al. (hereinafter “Kanno”) alone or U.S. Patent No. 6,415,011 to Helmersson (hereinafter “Helmersson”) in view of U.S. Patent No. 4,594,216 to Feutrel (hereinafter “Feutrel”).

Claims 25 and 48 have been amended, as indicated above, to include the sheet-shaped material being of a nickel-based alloy.

Kanno is directed to a fuel assembly for a nuclear reactor comprising a component of a zirconium alloy. In Kanno, a spacer having orthogonal spacer sheets or bars 21 and a surrounding spacer band 22 (FIGS. 4a and 4b) is disclosed. Each sleeve forms a single cell arranged to receive a single one of the fuel rods, thereby indicating that a cell is to receive only one fuel rod. The spacer band 22 (FIGS. 4a, 4b, 4c, and 4d) includes an overlapped portion.

Helmersson discloses a spacer 14 made of conventional sleeve-formed cells 16, i.e. sleeves that are cut from tubular elements, and which thus do not include any overlap. The cells 16 hold or allow elongated elements to pass therethrough. Each cell 16 further includes a

deflecting member 22, each of which includes a vane 24 that extends into flow channels 18 defined between the cells 16 located in the spacer 14.

Feutrel discloses a spacer formed of nested sheets forming a grid. As can be seen in FIG. 2 of Feutrel, a cylindrical sleeve 14 is formed using stamped sheet metal tongues 16 above cells of the grid, the tongues 16 overlapping each other. However, the cylindrical sleeve 14 formed by the tongues 16 is not intended for forming a cell for receiving a fuel rod, but a guide tube for a control rod.

Kanno fails to disclose, teach, or suggest a spacer for holding a number of elongated fuel rods, the spacer enclosing a plurality of sleeves, each sleeve being manufactured of a sheet-shaped material of a nickel-base alloy, the sheet-shaped material comprising a first connection portion in the proximity of a first end and a second connection portion in the proximity of a second end, the first end overlapping the second end, as recited in amended claims 25 and 48. A sleeve manufactured of a sheet-shaped material comprising end portions that overlap, as in claims 25 and 48, is not a spacer band having an overlap, as in Kanno. Although the spacer band 22 of Kanno shows an overlap (col. 1, lines 36-38, and FIG. 4b), such an overlap cannot lead a person skilled in the art to also make the individual cells with overlapping ends. A spacer band is a different part, and therefore other conditions and restrictions which are decisive when designing and constructing a spacer band than a sleeve forming a single cell of a spacer are applicable. Also, because the cell of Kanno receives only one fuel rod, such a cell is not analogous to a spacer enclosing a plurality of sleeves for holding a number of elongated fuel rods, as recited in claims 25 and 48.

Kanno also fails to disclose, teach, or suggest the sheet-shaped material having a thickness that is less than 0.20 mm, as recited in amended claims. It should be noted, that the thickness of the spacer band 22 in Kanno is defined to be 0.53 mm (col. 9, lines 58-64). This thickness is far greater than the proposed thickness of the material of the claimed spacer. Furthermore, it should be noted that the sleeves are to be combined with each other. In such instances, three and sometimes even four sheets are combined in parallel since the overlap joints in one sleeve are combined with another sleeve. Sheets as thick as 0.53 mm would then block far too much of the gap between the fuel rods.

Employing a nickel-based alloy, as recited in claims 25 and 48, enables manufacturing of the sleeve using a thin material, i.e. less than 0.20 mm. A thin material is very advantageous in a

nuclear reactor, since it allows for a minimum amount of neutron absorption. A thin material also means that less material is used than with a spacer of a thicker material, which translates into less material available to absorb neutrons and thus reduce the reactivity of the reactor.

Furthermore, a thin material contributes to the achievement of a low flow resistance in the coolant flowing through the fuel assembly during operation of the nuclear reactor plant. A low flow resistance will contribute to a higher efficiency of the reactor.

A further advantage of a thin material is that it enables the manufacturing through forming a sheet-shaped material into a sleeve, and, unlike Kanno, it further permits the ends of the material to overlap each other in the formed sleeve. Such an overlap can be tolerated when the sleeve is made of a thin material. Also, such a manufacturing process is relatively easy to perform, and thus the sleeve as recited in claims 25 and 48 can be made in an efficient manner and with high precision. The manufacturing manner also enables manufacturing of sleeves of different dimensions in an easy manner.

Accordingly, the advantages of the present invention as recited in claims 25 and 48 can thus be seen in a combination of the features defining the nickel-based alloy, the thin thickness of the material, and the overlapping of the ends of the sheet-shaped material.

Both Helmersson and Feutrel also fail to disclose, teach, or suggest a spacer for holding a number of elongated fuel rods, the spacer enclosing a plurality of sleeves, each sleeve being manufactured of a sheet-shaped material of a nickel-base alloy, the sheet-shaped material comprising a first connection portion in the proximity of a first end and a second connection portion in the proximity of a second end, the first end overlapping the second end, as recited in amended claims 25 and 48.

As stated above, the sleeves of the spacer of Helmersson are cut from tubular elements and do not include a first end that overlaps a second end. A spacer enclosing a sleeve manufactured of a sheet-shaped material comprising a first connection portion in the proximity of a first end and a second connection portion in the proximity of a second end, the first end overlapping the second end, as recited in amended claims 25 and 48, is not a sleeve that is cut from a tubular element, as in Helmersson.

Furthermore, the cylindrical sleeve of Feutrel includes elongated tongues that extend vertically over the entire length of the cylindrical sleeve, which means that one connection portion extends over the entire length of the sleeve. A spacer enclosing a sleeve manufactured of

a sheet-shaped material comprising a first connection portion in the proximity of a first end and a second connection portion in the proximity of a second end, the first end overlapping the second end, as recited in amended claims 25 and 48, is not a sleeve having one connection portion that extends over an entire length of a sleeve, as in Feutrel.

Because each of Kanno, Helmersson, and Feutrel individually fail to disclose teach, or suggest a spacer for holding a number of elongated fuel rods, the spacer enclosing a plurality of sleeves, each sleeve being manufactured of a sheet-shaped material of a nickel-base alloy, the sheet-shaped material comprising a first connection portion in the proximity of a first end and a second connection portion in the proximity of a second end, the first end overlapping the second end, as recited in amended claims 25 and 48, each of Kanno, Helmersson, and Feutrel necessarily fail to disclose such a spacer in combination.

Because Kanno, Helmersson, and Feutrel, individually and in combination, fail to disclose, teach, or suggest what Applicants recite in their amended claims 25 and 48, namely, a spacer for holding a number of elongated fuel rods, the spacer enclosing a plurality of sleeves, each sleeve being manufactured of a sheet-shaped material of a nickel-base alloy, the sheet-shaped material comprising a first connection portion in the proximity of a first end and a second connection portion in the proximity of a second end, the first end overlapping the second end, Kanno, Helmersson, and Feutrel, individually and in combination, fail to disclose, teach, or suggest all of the claim recitations of Applicants' invention. Consequently, because not all of the claim recitations are taught by the cited references, individually and in combination, Applicants' amended claims 25 and 48 are necessarily non-obvious, and Applicants respectfully request that the Examiner withdraw the rejections of claims 25 and 48.

Because claims 27, 33-38, and 40-44 depend from claim 25, and because claim 25 is asserted to be non-obvious for the reasons presented above, claims 27, 33-38, and 40-44 are necessarily non-obvious. Applicants, therefore, respectfully submit that claims 27, 33-38, and 40-44 are allowable. Accordingly, Applicants respectfully request that the rejections of claims 27, 33-38, and 40-44 be withdrawn.

Claims 28-30 and 45 have also been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Helmersson in view of Feutrel.

Claims 28-30 and 45 have further been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Kanno in view of either one of U.S. Patent No. 5,416,812 to Matzner or U.S. Patent No. 4,698,204 to Taleyarkhan.

Because claims 28-30 and 45 depend from claim 25, and because claim 25 is asserted to be non-obvious for the reasons presented above, claims 28-30 and 45 are necessarily non-obvious. Applicants, therefore, respectfully submit that claims 28-30 and 45 are allowable. Accordingly, Applicants respectfully request that the rejections of claims 28-30 and 45 be withdrawn.

Conclusion

Applicants believe that the foregoing amendments and remarks are fully responsive to the Office Action and that the claims herein are allowable. An early action to that effect is earnestly solicited.

If the Examiner believes that a telephone conference with Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is invited to telephone the undersigned.

Applicants believe that no fees other than the extension of time are due with the submission of this Amendment. If any charges are incurred with respect to this Amendment, they may be charged to Deposit Account No. 503342 maintained by Applicants' attorneys.

Respectfully submitted,

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